Source: julia-weihe-siowNXxBy1M-unsplash

SEDIMENT REMEDIATION PAYS OFF

SOCIO-ECONOMIC ANALYSIS

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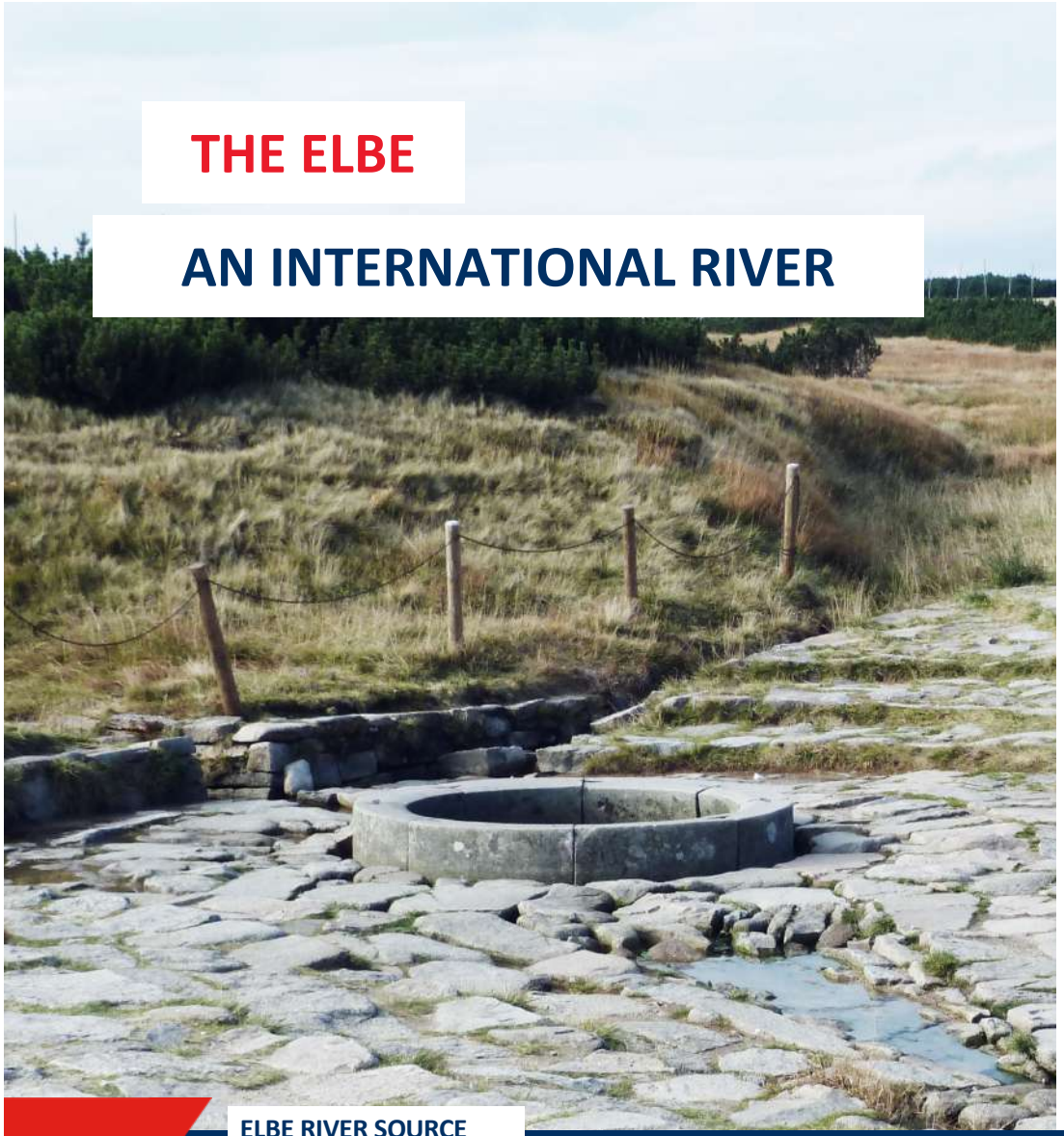
Hamburg

THE ELBE

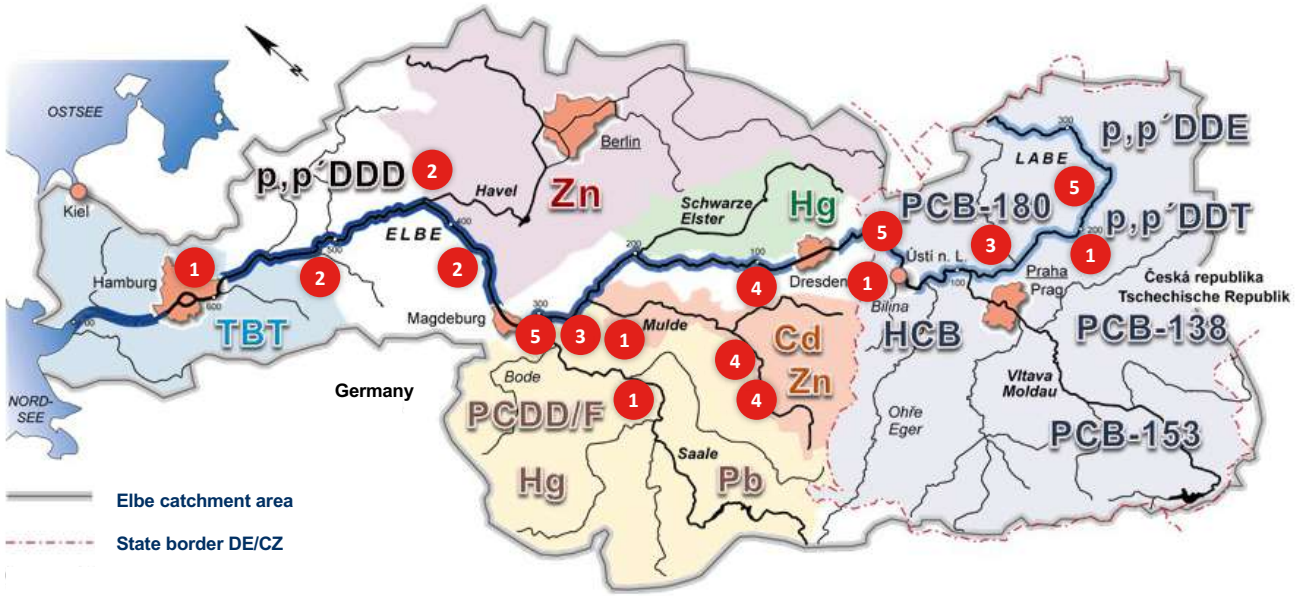
AN INTERNATIONAL RIVER



ELBE RIVER SOURCE

- **Length:** 1,091 km
- **Area:** 148.268 km²
- **MQ**$_{\text{North Sea}}$**:** 877 m³
- **Population:** 25 Mio people (D, CZ)
- **Industry/Mining:** over centuries
- **Agriculture:** 56% of the catchment

Main pollution areas



1 Industry

2 Side structures

3 Major barrages

4 Old mining

5 Old sites

Sources: map: RBC Elbe, 1,2,3,5: ELSA, 4: J. Kugler

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Source:

Challenges & needs for the implementation process of sediment remediation measures

- **Challenges:** What does complicate the implementation?

Complexity of the system …	Principle of proportionality in management planning	High, unevenly distributed costs …
Detailed risk analyses and expensive feasibility studies	Lack of clear political commitment … Insufficient consultation and cooperation	Lack of (basin-wide accepted) socio-economic approaches

- **Needs:** What do we need to encourage implementation?
  "Be well informed – Manage adaptively – Take a participatory approach"

System knowledge	Reduce the responsibility ripple	Prioritization & efficient combination of measures
Comprehensive stakeholder involvement in decision-making	WFD and beyond: Political impulse „pro sediment"	Solidarity approach „river basin bugdet"

Sources: 1: HAW (Heise); 2: HPA; 3: UFZ (Künzelmann); 4: HU (Blohm); 5: ELSA; 6: Tauw

DISPROPORTIONATE OR UNAVOIDABLE -

WHICH COSTS ARE REASONABLE?

what is the monetary value of unpolluted sediments?

Source: Bukea, Icon made by surang from www.flaticon.com

Requirement of the WFD?

Water Framework Directive

Art. 4 (5).
Member States may aim to achieve **less stringent environmental objectives** […] for specific bodies of water when they are so affected by human activity, […] or their natural condition is such **that the achievement** of these **objectives** would be infeasible or **disproportionately expensive**, […]

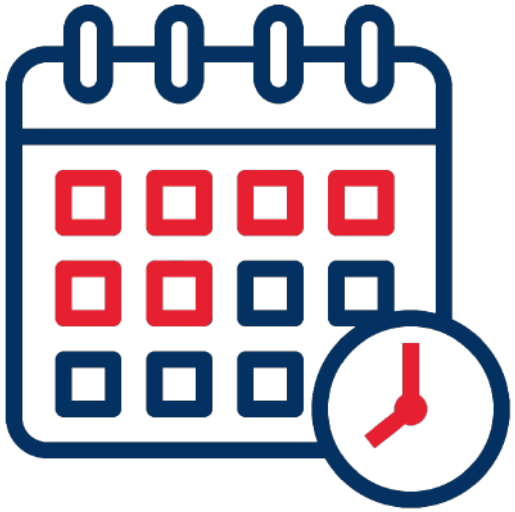
ANNEX III
Economic Analysis
The economic analysis shall contain enough information in sufficient detail (taking account of the costs associated with collection of the relevant data) in order to: …

Socio-economic approach to find and finance the most cost-effective combination of sediment remediation measures in the international Elbe river basin

Cost-benefit analysis

Source: lawrence-hookham-cxvWMAea9h0-unsplash

Cost-benefit analysis – the process



- Concept, selection and design of the measure: 2019
- Expert discussions and data collection: 2020
- Evaluation of data, method research costs/benefits, preparation of additional expert contributions to at least make the benefits for the maintenance of waterways visible: 2020-2021
- Evaluation of costs and benefits: 2022
- 2022: Change in the geopolitical situation with massive impacts also for the sectors affected here
- **Status now:** Partial aspects are still not completed, the overall result remains

Cost-benefit analysis – Concept and design of the fictional measure

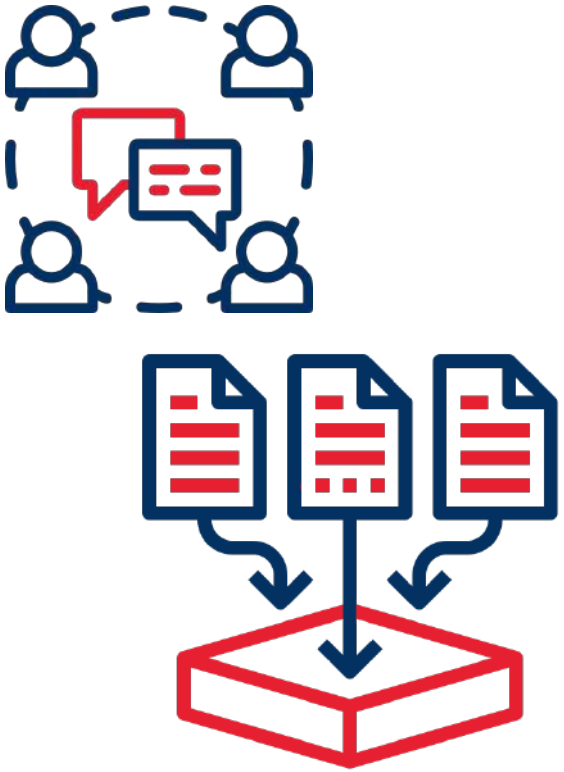
Pollutant load: reduce to up to 68 % (simplified)

sedimentation basin: width ~ 300 m, length ~ 50 km, depth ~ 12 m

based on a real planning from the 1980s

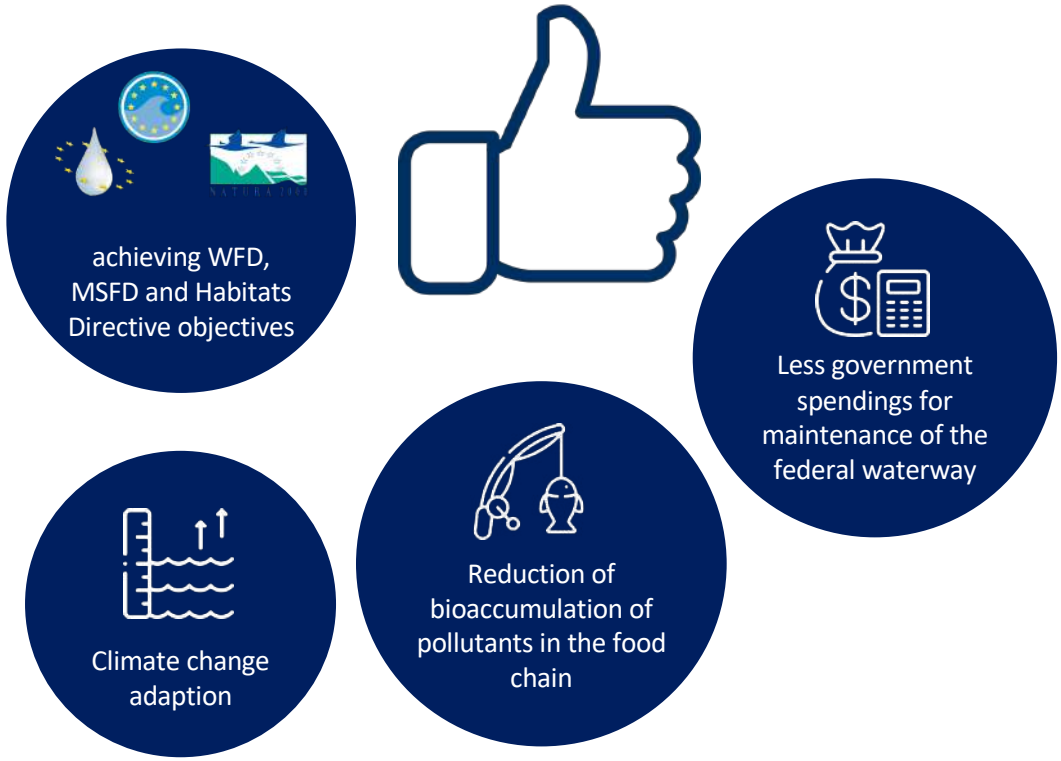
Cost-benefit analysis – expert discussions and data collection

- **5 expert discussions** in the user groups "agriculture, fisheries, shipping and tourism" and for the protected good "environment/nature conservation“
- **1 data collection meeting** with experts from all user groups: test catalogue with a complete inventory
- **intensive follow-up**: data research, expert contribution



Possible positive and negative effects

qualitative assessment by experts



Source: sara-kurfess-E8AabnQITtQ-unsplash, tim-photoguy—_b5xwxvpIE-unsplash
Icon "thumbs up and down" made by pixel perfect, Icon "fishing, goal, hydro power" made by Freepik from www.flaticon.com

Monetisation of benefits and costs

- biodiversity in and around surface water bodies
- waterway maintenance costs

- fictional measure
- Tourism
- legal dispute

Source: Source: Icon "balance" made by Freepik from www.flaticon.com

Monetisation of benefits and costs – method

- biodiversity in and around surface water bodies determined by willingness to pay study
- waterway maintenance costs determined by cost rates and unit prices, expert judgement

- fictional measure determined by measure cost
- tourism determined by expert judgement, literature research, fee regulations and ordinary staff costs
- legal dispute determined by expected value, comparable lawsuits

Source: Source: Icon "balance" made by Freepik from www.flaticon.com

Monetisation of benefits and costs – some results

- biodiversity in and around surface water bodies
  ~ 415 million €/year for a period of 10 years
- waterway maintenance costs determined by cost rates and unit prices, expert judgement
  ~ 30 million €/year + 612 million €/10 years

period under review: 50 years

- fictional measure **~ 4 billion € for 50 years**
- Tourism determined by expert judgement, literature research, fee regulations and ordinary staff costs
  ~ 49,000 €/year
- legal dispute **~ 2.3 million €**

Source: Source: Icon "balance" made by Freepik from www.flaticon.com

Monetisation failed/could not be achieved for

- impacts on other environmental goods and ecosystem services, e.g. less pollutants in biota, birds, fish fauna, marine environment
- contribution to the achievement of WFD and MSFD objectives
- benefits of pollutant-free/unpolluted sediments against the background of sea-level rise for coastal protection
- negative impact on navigability/shipping and fishing
- negative impact on UNESCO status

Why? Monetisation failed/could not be achieved for

1. qualitative data only from the experts (percentages or similar)
2. lack of methods or applicable cost rates, no price for pollution to water/sediment for contaminants
3. transferability to sediments/our case study not given
4. lack of methods or applicable cost rates for ecosystem services, e.g. flood protection, climate change mitigation

Example

transferability not given
(not permissible from the expert's point of view)

example 1:

Environmental Prices

Handbook 2017

Methods and numbers for valuation of environmental impacts

CE Delft
Sander de Bruyn et al. 2018

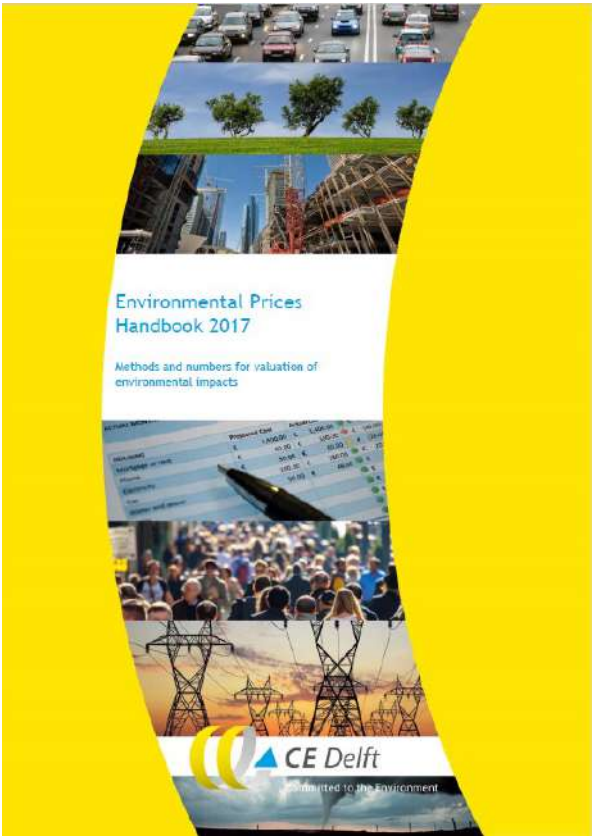


Table 7 Environmental prices for key emissions to the soil (€ 2015 per kg emission)

pollutant	lower	central	upper
Cadmium	€ 24.3	€ 2,039	€ 6,248
Arsenic	€ 21.6	€ 69.3	€ 168
Lead	€ 0.107	€ 14.2	€ 43.6
Mercury	€ 864	€ 1,549	€ 2,959
Nickel	€ 0.0326	€ 0.342	€ 0.965

transferability to sediments not given

Cost-benefit analysis - result

costs and benefits for a period of 50 years

economic benefit
11.5 billion €

economic costs
3.9 billion €

cost-benefit ratio
+ 7.6 billion €

- **benefits clearly exceed the costs, i.e. measure would make sense from an economic point of view**
- **monetary economic benefits arise mainly for biodiversity in and around water bodies downstream the measure as well as the maintenance of the waterways**

…preliminary result (final calculation still pending)

Source: lawrence-hookham-cxvWMAea9h0-unsplash

What to do?

- Measure has a high efficiency. A reduction in pollutants is achieved. However, the added value for the marine environment cannot be quantified.
- The requirements/standards of environmental legislation are increasing, but methods for achieving the goals are lacking.

1. **Uniform cost rates for emissions of pollutants to water and sediment in the EU. Put a price on pollution!**

2. **Uniform cost rates for ecosystem services of waterbodies and marine environment**

Burden sharing

Source: lawrence-hookham-cxvWMAea9h0-unsplash

THANK YOU FOR YOUR ATTENTION!

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